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**PUBLIC HEALTH INVESTIGATION**  
**RESPIRATORY AND OCULAR ILLNESS OUTBREAK**  
**MARCH 5-8, 2009 STATE SWIM MEET**  
**WALLACE POOL**  
**UNIVERSITY OF MAINE AT ORONO**

**SUMMARY REPORT**

**June 23, 2009**

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The following programs participated in the public health investigation and in the preparation of this report:

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Division of Environmental Health  
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**Health Inspection Program  
Division of Environmental Health  
Maine Center for Disease Control and Prevention**

**Infectious Disease Epidemiology Program  
Division of Infectious Disease  
Maine Center for Disease Control and Prevention**

**Safety Works  
Bureau of Labor Standards  
Department of Labor**

## Executive Summary

This report provides a summary of the Maine Center for Disease Control's (ME-CDC) investigation of reports of illness associated with the state swim meet that occurred March 5-8, 2009 at the University of Maine at Orono (UMO) Wallace Pool. The illness, characterized by acute onset of coughing, sneezing, burning eyes and possibly gastrointestinal symptoms beginning on Saturday March 7, was first reported to ME-CDC by a school nurse on Tuesday, March 10, 2009. ME-CDC initiated a public health investigation to determine the scope and severity of the illness, provide an explanation for this occurrence, and recommend interventions to prevent illness at future events.

The public health investigation included:

- an electronic survey developed by ME-CDC's Infectious Disease Epidemiology Program to document the types of health symptoms reported by the swimmers and spectators attending the event;
- a pool inspection performed by the ME-CDC's Health Inspection Program to document whether the pool was operated and maintained according the ME-CDC rules, and depending on the findings, to make recommendations with respect to ongoing operation and maintenance of the pool;
- a review of the operation and maintenance of the ventilation and exhaust systems by the Department of Labor's SafetyWorks Program to document whether these systems were working properly during the swim meet event, if not, why not, make any recommendations for improving operation and maintenance practices and perform a final inspection to confirm that the system is now operating properly; and
- a literature review performed by ME-CDC's Environmental and Occupational Health Program to learn from similar events that have occurred elsewhere and to better understand the health effects from potential chemical exposures.

In addition, UMO performed an independent investigation of the illness outbreak lead by their Safety and Environmental Management Department. The purpose of UMO's investigation was to provide a comprehensive review of the incident and to identify potential causal factors and contributing factors of the illness outbreak. UMO's final report was reviewed as part of the ME-CDC's public health investigation.

Based on the information gathered from the electronic survey, coughing, burning eyes, sneezing and sore throat were the most common symptoms reported by participants and spectators. The median date of onset of symptoms was Sunday, March 7, while the median date of resolution of symptoms was Wednesday, March 10 with symptoms lasting, on average, 3.7 days. Because only a small percentage of the affected individuals consumed food from the concession stand and gastrointestinal symptoms were not commonly reported, an enteric outbreak from a food source was ruled out as responsible for the illness.

The review of the pool chemical monitoring records found that free chlorine levels were slightly elevated in the pool during the swim meet, based on current regulations. However, the free chlorine levels would be within normal levels under new proposed regulations. Other pool chemistry parameters (e.g., pH) were normal and maintained at acceptable levels throughout the weekend of the swim meet, except for pH which was slightly outside the ideal range.

At the time of the pool inspection on March 12, 2009, the exhaust fans were found to be off. In addition, loose belts were found on the air handlers in the balcony area. Because the main shutoff for the exhaust fans is located just below the light switch for the mechanical room, it is possible that the exhaust fans may have been inadvertently shut off when a pool employee was turning the lights on or off. UMO reported that the exhaust fans were found to be off and the mechanical room door unlocked when technicians arrived to upgrade the alarm system for the pool building on the day following the swim meet. Therefore, it appears likely that the exhaust fans were off for at least a portion of the swim meet.

UMO's independent investigation concluded that the immediate cause of the incident was likely related to the exhaust fans that may have been shut off sometime prior to or during the meet, causing poor air exchange at some point during the meet.

Based on a review of the literature and in consideration of the above, the reported outbreak of illnesses appears most likely related to elevated chloramine levels in the indoor pool environment. Chloramines form through the reaction of chlorine-based disinfectants with the nitrogen-containing compounds found in the sweat and urine of swimmers. Once chloramines form in water, they volatilize into pool room air and cause symptoms of respiratory and eye irritation. The literature review identified a number of reports of short-term ocular and respiratory illness following use of indoor swimming pools. In each of the reports, pool chemistry parameters such as pH, free, combined and/or total chlorine, and chloramine levels in water were documented as being outside the range of acceptable levels and ventilation was determined to be inadequate. The use of the pool by hundreds of swimmers during the March 5-8, 2009 swim meet likely contributed significant amounts of nitrogen-containing compounds to the pool and strongly favored chloramine formation even under conditions of normal free chlorine levels and pH. The agitation of the pool water by the large number of swimmers provided an additional factor contributing to the potential for elevated chloramine concentrations in indoor air. The likelihood that the exhaust fans may have been turned off sometime before or during the meet provides a final piece of evidence suggesting chloramines as the causative agent for the reported swim meet illnesses.

Recommendations to prevent the future occurrence of a similar event include: (1) expanded monitoring of pool chemistry during swim meets/events; (2) improved security for mechanical room access to minimize the chance of accidental shutoff of equipment; (3) updated operating procedures to include routine monitoring of exhaust fans, air handlers, and air return grates; (4) development of a formal preventative maintenance program for pool ventilation and exhaust systems; (5) posting of informational materials

containing contact information of persons in charge should pool users have concerns in the future; and (6) posting of signs requiring all pool users to practice proper personal hygiene such as the need to shower before entering the pool.

Implementation of these corrective actions will greatly reduce the chance of this type of incident being repeated since these steps will allow for the monitoring of chloramine levels in pool water, minimize the likelihood that the ventilation and exhaust systems will not be operating as designed during events, and educate pool users as to the importance of personal hygiene and communication in maintaining a safe and healthy environment at indoor pools.

## **1.0 Introduction**

The purpose of this report is to present a summary of the ME-CDC investigation of the illness outbreak that occurred following the March 5-8, 2009 swim meet at UMO's indoor pool. The report provides a compilation of information related to the illness outbreak and is organized into the following sections:

- Section 2.0 (Review of Incident) summarizes of the events surrounding the illness presentation and the initial response of ME-CDC to the illness reporting, and chronicles the investigations that ensued;
- Section 3.0 (Findings) provides the outcome of the investigations initiated in response to the reported illness which included an electronic survey performed by ME-CDC's Infectious Disease Epidemiology Program to determine symptom prevalence, pool and ventilation inspections performed by ME-CDC's Health Inspection Program, an Enforcement Inspection performed by the Department of Labor's SafetyWorks Program to review the investigations performed by UMO's Safety and Environmental Management Department, and a literature review conducted by ME-CDC's Environmental and Occupational Health Program to gather information on similar incidents reported at other indoor pools;
- Section 4.0 (Discussion) identifies the likely causative and contributing factors of the illness, based on the specific findings of the investigations and literature review; and
- Section 5.0 (Recommendations) provides a summary of recommended actions to be implemented to prevent illness at future events.

## **2.0 Review of Incident**

In this section, a chronology of events surrounding the illness reporting is provided including the sequence of response events and investigations that followed the reporting. In addition, a description of the investigations initiated by ME-CDC, UMO, and the Department of Labor along with the roles and responsibilities of each of the responding programs is provided.

### **2.1 Illness Presentation and Response Actions**

On the evening of Thursday, March 5, 2009, a statewide swim meet brought together approximately 566 team members and an additional 400 coaches, spectators and officials to the indoor pool on the UMO campus. The swim meet concluded on the evening of Sunday, March 8, 2009.

A possible illness outbreak associated with the swim meet was first reported to ME-CDC's Infectious Disease Epidemiology Program on Tuesday, March 10, 2009. The caller was a school nurse and stated they were aware that a number of individuals attending the swim meet had acute onset of coughing, sneezing, and burning eyes. The symptoms had reportedly begun on Saturday, March 7, 2009 and continued into the early part of the week. The school nurse also reported vomiting and diarrhea in two of her school's swim team members who has attended the event, though it was unclear if these symptoms were related to the event. As is standard practice for reports of an outbreak of illness at an event of this type, a public health investigation was initiated by ME-CDC to determine the scope and severity of illness, provide an explanation for the occurrence, and recommend interventions to prevent illness at future events. ME-CDC staff contacted the swim meet coordinator to obtain details about the event such as the number of participants, dates of the event, pool contacts, and contact information for each of the teams involved.

On the morning of March 11, 2009, the ME-CDC Health Inspection Program (HIP) was notified because of their jurisdiction over the proper operation and maintenance of public swimming pools for safety and sanitation concerns. In addition, the UMO Athletic Department was contacted to obtain information about any complaints related to the event. UMO's SEM Department informed ME-CDC that a Tier I investigation had been performed on March 9, 2009 due to a parent complaint made to the Department of Environmental Protection (DEP) on Saturday, March 7, 2009, concerning a possible chlorine release at the pool.

Later in the day, an electronic survey was developed by ME-CDC staff primarily to determine whether the outbreak was related to an enteric or infectious agent. Concurrent with survey development, ME-CDC Environmental and Occupational Health Program staff began researching published studies on outbreaks of eye and respiratory irritation at indoor pool events associated with exposure to chemical byproducts produced when chlorine disinfectant chemicals react with sweat and urine from swimmers. This research effort was initiated to assist in determining possible causes of or contributing factors to the reported illness.

The electronic survey was distributed to the swim team contacts on March 12, 2009. On the same day, ME-CDC's HIP performed an inspection of the pool and food services. ME-CDC's HIP inspector also met with UMO staff and a Heating, Ventilation, and Air Conditioning (HVAC) specialist for a more comprehensive assessment of the operation and maintenance of the ventilation and exhaust systems for the indoor pool. Because ME-CDC had received reports of multiple illnesses, UMO's SEM Department initiated a comprehensive Tier II investigation which included the activation the UMO's Emergency Operations Center (EOC).

Following the completion of the supplemental information gathering and inspections that occurred on March 12, UMO's EOC was closed on March 13, 2009. The electronic survey initiated by ME-CDC was closed on Tuesday, March 17, 2009. On March 20, 2009, a staff industrial hygienist from the Department of Labor's SafetyWorks Program met with UMO SEM Department staff to review the investigations performed to date in response to the reported illnesses, to conduct an independent review of the ventilation and exhaust systems, and to review UMO's corrective action plan prepared in response to the incident.

## 2.2 Summary of Investigations

The investigatory efforts undertaken in response to the outbreak include:

- an electronic survey prepared by ME-CDC's Infectious Disease Epidemiology Unit to gather information on the type and severity of symptoms and their date of onset and duration to determine whether the illness was from a food-related source, an infectious agent, or more likely related to a chemical exposure;
- a pool inspection performed by ME-CDC's Health Inspection Program to review records of chemical usage and monitoring, and to inquire as to the proper functioning of the ventilation and exhaust systems;
- an independent investigation of the event conducted by UMO's Safety and Environmental Management (SEM) Department which included a review of maintenance records, pool chemical usage, and normal operation of the ventilation and exhaust systems to document whether the procedures and systems were functioning properly and to make recommendations concerning improvements that may be required for the procedures and systems;
- a pool visit by an Enforcement Officer of the Department of Labor's SafetyWorks Program to review the scope and completeness of the UMO investigation, independently inspect the pool and related mechanical systems including the ventilation and exhaust system, and review UMO's corrective action plan written in response to this incident; and
- a literature review performed by ME-CDC's Environmental and Occupational Health Program of published studies on outbreaks of eye and respiratory irritation at indoor pool events to assist in better understanding the reported illness.

The following sections provide a detailed description of the scope of each of the investigatory efforts.

**Electronic Survey.** Due to the unknown etiology of the outbreak, the electronic survey was developed to quickly gather evidence on the type and severity of reported symptoms, onset date of these symptoms, resolution of illness, and the role of the individual at the event experiencing symptoms (i.e., swimmer, spectator, coach, or official). The primary objective of the survey was to determine whether the illness was

related to a food source, a contagious agent or was more likely related to a chemical exposure. The survey was open for four days.

The survey consisted of 20 questions developed by ME-CDC epidemiologists and environmental and occupational health staff. The survey questions are included in Attachment A of this report. An email announcing the survey was sent to team contacts, UMO officials, the swim team event coordinator, and the official coordinator requesting that the email and survey link be forwarded to all participants. By the time the survey closed, there were 378 responses with 331 individuals completing the entire survey. Responses to the survey were anonymous. Because the survey was not available until 5 days after the event, there may have been some error in recalling dates of illness onset by responders.

For each individual responding, the survey questions were aimed at determining the age, sex and role of respondent, the amount of time that was spent at the pool, where in the pool building time was spent (pool deck, bleachers, etc.), whether food was consumed from the concession stand, symptoms experienced, the date of onset and duration of symptoms, whether medication was taken to alleviate the symptoms, and whether medical attention was sought for the illness.

**Pool Inspection.** ME-CDC's Health Inspection Program has rules that govern proper operation and management of swimming pools for safety and sanitation concerns. The district health inspector inspected the pool and the food concession stand, and gathered other related information from UMO staff. Documents on chemical monitoring and maintenance of the pool were obtained and transmitted to ME-CDC for detailed review. Material Data Safety Sheets for the chemicals used at the pool were also reviewed. A review of food concession procedures determined that sandwiches were delivered from the school canteen in a cooler, and hot dogs were steamed on-site. Inquires were also made concerning the appropriate functioning of the ventilation and exhaust systems as well as their maintenance and service. Normal functioning of the ventilation and exhaust systems was reviewed with a HVAC system specialist.

**UMO Investigations.** UMO's SEM Department completed Tier I and Tier II investigations. As part of the Tier I investigation, UMO athletics, pool maintenance, the Orono Fire Department, and DEP were contacted and consulted. The following information was gathered and reviewed as part of the Tier II investigation:

- Event security/safety planning sheets for February and March;
- Ventilation and exhaust system maintenance procedures;
- Ventilation and exhaust system maintenance records and work order details;
- Pool sampling results for February and March;
- Certified pool operators training records;
- ME-CDC's HIP site visit report; and
- Correspondence from DEP and ME-CDC related to the event.



Based on UMO's review of the available information, an analysis for the pool incident was prepared with an associated corrective action plan and target dates for implementation of any necessary corrective actions. ME-CDC received UMO's Corrective Action Plan (dated March 20, 2009) on March 24, 2009.

**SafetyWorks Inspection.** An Enforcement Officer from the Department of Labor SafetyWorks Program met with UMO SEM staff to review the incident and the events leading up to the incident, inspect the ventilation system including the exhaust units, fresh air intakes, circulation fans, and mechanical room, and review the chemical treatment and monitoring procedures used for the pool. The Corrective Action Plan developed by UMO was also reviewed during the visit.

**EOHP Literature Review.** Early in the investigation, EOHP conducted literature searches to retrieve published information available for similar incidences. Following the identification and retrieval of published reports of illness at indoor pools, the studies were reviewed to determine the applicability of the published report to the swim meet incident through a review of the details of the study as well as its conclusions as to the cause of the illness. In addition, studies on chlorine water chemistry were researched to determine chemicals that may form as by-products of the chlorination process in indoor pools.

### 3.0 Findings

Based on the investigations performed, the following sections detail the findings of the investigations.

#### 3.1 Symptom Prevalence

Major findings of the electronic survey include:

- 75% of respondents did not consume food at the concession stand.
- 74% of respondents reported illness.
- Of those that reported symptoms, 78% reported coughing, 67% reported burning eyes, 52% reported sneezing, 46% reported sore throat, and 10% reported vomiting and diarrhea.
- The median date of onset of symptoms was Sunday, March 7, while the median date of resolution of symptoms was Wednesday, March 10.
- On average, symptoms lasted for 3.7 days.
- 73% of individuals with symptoms used over-the-counter or prescription medications to ease the symptoms.
- Though there were no hospital admissions, 20% of individuals with symptoms sought medical assistance from health care providers.

Based on the information gathered from the electronic survey, an enteric outbreak from a food source was ruled out as responsible for the illness and will not be discussed further in this report.

### 3.2 Pool Inspection

The review of the chemical monitoring records found that free chlorine levels were slightly elevated in the pool, based on current regulations. Free chlorine levels ranged from 3 to 4 parts per million (ppm) between March 5<sup>th</sup> and March 8<sup>th</sup>. Current regulations indicate an ideal range of free chlorine of between 1 and 3 ppm. However, the free chlorine levels would be within normal levels under new proposed regulations (ideal range of 2 to 4 ppm). Other pool chemistry parameters were normal and maintained at acceptable levels throughout the weekend of the swim meet except for the pH range (measured as 7.2 to 7.6) which was slightly outside the ideal range (7.4 to 7.6) stated in the regulations. Certified Pool Operators had monitored the pool chemistry during the weekend of the swim meet. No data were available for total and combined chlorine levels in pool water, or for other chlorine-containing compounds (e.g., chloramines) in water or air. The measurement of total and combined chlorine would have allowed the estimation of chloramine levels in the water.

### 3.3 Ventilation and Exhaust System Inspection

At the time of the Health Inspection Program inspection on March 12, the exhaust fans, whose controls are located in the pool's mechanical room above the Wallace Pool, were not turned on. In addition, loose belts were found on the air handlers in the balcony area.

The Department of Labor's Enforcement Officer noted that his inspection could not determine why the exhaust fans were in the off position. However, he observed that the main shutoff for the exhaust fans is located just below the light switch for the pools' mechanical room and it is possible that the exhaust fans may have been inadvertently shut off when a pool employee was turning the lights on or off. The switches are on the far side of a wall and not visible to pool staff, increasing the likelihood that the exhaust fan switch may have been mistakenly moved to the off position. It should also be noted that the alarm system to the building was upgraded on March 9, 2009, the day after the swim meet ended. UMO reported that the exhaust fans were found to be off and the mechanical room door unlocked when technicians arrived to upgrade the alarm system for the pool building. Therefore, it appears likely that the exhaust fans were off for at least a portion of the swim meet.

### 3.4 UMO Investigations

UMO's Tier I investigation concluded, with concurrence from DEP, that there had not been a release of chlorine at the facility. Chlorine tablets, which are fed into the pool by an automated system, are used as the chemical disinfectant.

According to UMO's Corrective Action Plan, the immediate cause of the incident was the shut off of the exhaust fans at the main shutoff some time prior to the swim meet. This occurrence caused poor air exchange at some point during the swim meet. In

addition, the pool's mechanical room access door was found unlocked. This finding was identified as a potential causal factor and may have contributed to the accidental shut off of the exhaust fans.

### 3.5 Literature Review

The literature review identified a number of published reports of short-term ocular and respiratory illness following use of indoor swimming pools. Three of the published reports are briefly summarized below:

- In August 1999, over 130 children and adults complained of breathing difficulties and eye and throat irritation following use of an indoor pool with a wave machine (Goyder, 2000). There were problems with the pool disinfection system over the two week period preceding the incident. The number and severity of reported symptoms was related to the length of time spent at the pool with individuals present for greater than 2 hours experiencing the most severe symptoms. The most likely cause of the incident was determined to be elevated air chloramine levels caused by the high air temperatures, increased water agitation, high pool usage and relatively poor ventilation.
- In January 2004, outbreaks of ocular and respiratory symptoms were investigated at the indoor swimming pool of two separate hotels (Bowen et al., 2007). At one of the pools, a total of 26 individuals reported symptoms of burning and watery eyes, cough, sore throat, and headache. Free chlorine levels were elevated during the outbreak, and the ventilation system had been turned off because of the low outdoor temperatures. At the second hotel, 46 individuals reported ocular and respiratory symptoms following use of the indoor pool. An elevated combined chlorine level was recorded on the day of the outbreak. Though the ventilation system appeared to be operating properly, pool usage exceeded the 41-bather limit established for the pool by 50 to 75 percent. In both outbreaks, contact with the pool water was not required to produce symptoms. It was concluded that chloramines likely contributed to the illnesses due to the excess free chlorine levels and poor ventilation noted at the first pool, and the excess combined chlorine levels and elevated usage at the second pool.
- In December 2006, 24 individuals reported symptoms of burning eyes, sore throat, coughing, sneezing, burning inside the nose, wheezing, chest tightness and shortness of breath following the use of an indoor pool at a motel (MMWR, 2007). One child was hospitalized with severe inflammation of the epiglottis and bronchitis. Following the incident, free chlorine levels less than half the minimum acceptable level, chloramine levels eight times the maximum acceptable level, and a pH approximately half the minimum acceptable level were measured in pool water. In addition, the ceiling exhaust fan was turned off at the time of the outbreak and the outside windows were closed because of cold outdoor temperatures. The outbreak was likely the result of exposure to elevated levels of chloramines that accumulated in the air in the enclosed space above the swimming pool.

In each of the reports, pool chemistry parameters such as pH, free, combined and/or total chlorine, and chloramine levels in water were documented as being outside the range of acceptable levels and ventilation was determined to be inadequate or the bather load was determined to be high. Each of the literature reports attributed the reported illness to exposure to chloramines in air at the indoor pool. Chloramines form through the reaction of chlorine-based disinfectants with the nitrogen-containing compounds found in the sweat and urine of swimmers. Once chloramines form in water, they may volatilize into pool room air. The indoor pool smell, commonly attributed to chlorine, is actually caused by chloramines in air. As the number of swimmers using the pool increases, chloramine formation and its release to pool air also increases through the combination of elevated deposition of nitrogen-containing human secretions into pool water and the increased agitation of the water surface facilitating volatilization to air. Chloramine exposure is correlated with complaints of irritation to the eyes, throat and respiratory system, consistent with the symptoms reported in the literature and in those that attended the March 5-8, 2009 swim meet.

Methods to test chloramine levels in air exist, but are not routinely used because they need to be performed in a laboratory setting and the results are not available until days after the sample is taken, limiting the usefulness of the method to make real-time decisions of pool air quality. Though chloramine levels in air were not measured during any of the literature reported incidents, several factors strongly suggest that high chloramine air levels were the cause of the illnesses. First, complaints of coughing and red, burning eyes began within hours of entering the pool area. These types of respiratory and ocular symptoms are known to occur following short-term exposure to chloramines in air. Second, pool water chemistry parameters were inadequately controlled in each of the literature reports. Conditions that favor chloramine formation in water include acidic water, elevated total chlorine levels, and high pool usage that contribute nitrogen-containing compounds to the water from human secretions. One or more of these factors was documented concurrent with the reported illness outbreaks. Finally, in each case, inadequate ventilation was noted as a result of closed windows, broken or improperly functioning ventilation and exhaust equipment, or manual operation of the ventilation and exhaust systems to retain heat. The inadequate ventilation likely resulted in the accumulation of chloramines in indoor air and the onset of symptoms following exposure to the impacted air.

#### **4.0 Discussion**

The reported illnesses appear to most likely be related to elevated chloramine levels in the indoor pool environment. The literature review of other similar events and the health inspection of this event reinforce the belief that outbreak is more likely associated with a chemical exposure that may have been exacerbated by a compromised exhaust system.

The literature review found that the symptoms reported following the swim meet at the UMO pool, including their acute onset and rapid resolution, are consistent with

published reports on exposure to chloramines in indoor pool environments. The literature reports of ocular and respiratory symptoms following indoor pool usage identified acidic water conditions, elevated total chlorine levels, and inadequate ventilation as contributing factors to the presence of elevated air chloramine concentrations. Though free chlorine and pH measurements at the UMO pool were generally within acceptable ranges during the swim meet, there was no measurement of total or combined chlorine levels which are better indicators of the potential for chloramines to be present in the water. However, the use of the pool by hundreds of swimmers during the meet likely contributed significant amounts of nitrogen-containing compounds to the pool and strongly favored chloramine formation even under conditions of normal free chlorine levels and pH. The agitation of the pool water by the large number of swimmers attending the meet provided an additional factor contributing to the potential for elevated chloramine concentrations to be present in indoor air. Finally, it is likely that the ventilation and exhaust systems were not fully operational during the entire event. The likelihood that the exhaust fans were turned off sometime before or during the meet provides a final piece of evidence implicating chloramines as the causative agent for the reported swim meet illnesses.

Based on a review of the literature and in consideration of the above, it is likely that poor ventilation in combination with high pool usage produced elevated levels of chloramines in the pool air, resulting in a chemical exposure that was responsible for the reported symptoms. However, no data are available on chloramine levels during the weekend of the swim meet, and the necessary data are not available to estimate chloramine levels that may have been present in the pool water.

## **5.0 Recommendations**

A number of recommendations to prevent the future occurrence of a similar event have been developed by ME-CDC. In addition, UMO developed a list of corrective actions to be implemented over the next few months.

ME-CDC's Health Inspection Program recommends the following actions be taken by the University:

- Broaden monitoring of pool chemistry daily, including measurement for free, total and combined chlorine levels from which chloramine levels can be estimated;
- Monitor and document pool chemistry parameters four times per day during swim meets/events;
- Monitor exhaust fans daily to ensure proper operation;
- Post signs requiring all pool users to practice proper personal hygiene such as the need to use toilets and shower before entering the pool.

UMO has compiled the following list of corrective actions to be completed between now and the end of June 2009:

- Change the lock on the pool's mechanical room door;
- Install new belts on the air handlers;
- Require that the ventilation and exhaust systems be inspected by UMO Facilities Management prior to major events;
- Develop a formal preventative maintenance program for the pool ventilation and exhaust systems;
- Update operating procedures to include routine monitoring of exhaust fans, air handlers, and air return grates, and review the procedures with staff; and
- Post informational materials containing contact information of persons in charge should pool users have concerns during future events.

Implementation of these corrective actions will greatly reduce the chance of this type of incident being repeated since these steps will allow for the monitoring of chloramine levels in pool water, minimize the likelihood that the ventilation and exhaust systems will not be operating as designed during events, and educate pool users as to the importance of personal hygiene and communication in maintaining a safe and healthy environment at indoor pools.

For further information about the investigations summarized in this report, please contact:

- Dr. Andrew Smith, State Toxicologist – 866-292-3474
- Dr. Diane Silverman, Toxicologist – 866-292-3474

#### References:

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**ATTACHMENT A  
ELECTRONIC SURVEY**

# 1. Maine Swimming Inc. Winter Combined Championships incident survey

Dear Event Attendee:

The Maine Center for Disease Control and Prevention has received reports of possible illness that occurred during the Maine Swimming Inc. Winter Combined Championships. An investigation has been started to obtain additional information about possible cases, symptomology, and risk factors. Could you please fill out one survey for each individual who attended the event to help identify and respond to the problem?

## 1. What is your age?

Age

## 2. What is your gender?

☐

Male

☐

Female

## 3. What is your swim club?

☐

Bangor Y Barracudas

☐

Canoe City Swim Club

☐

Casco Bay Regional YMCA

☐

Coastal Maine Aquatics

☐

Downeast Family YMCA

☐

Hurricane Swim Club

☐

Mid-Maine Dolphins

☐

Mount Desert Island YMCA

☐

Northern York County YMCA

☐

Penobscot Bay Area YMCA

☐

Pine Tree Swim Club

☐

Piscataquis Region YMCA

☐

Portland Porpoise Swim Club

☐

Sanford Y Titans

☐

Seacoast Swim Club

☐

Twin Cities Swim Team

☐

Waldo County YMCA

☐

Westbrook Seals

☐

Wiscasset Unsinkables

☐

Individual (not part of a Club)

☐

Other (please specify)



**4. What was your role at the Maine Swimming Inc. Winter Combined Championships (choose one answer)?**

- ☐ Swimmer
- ☐ Parent-Official
- ☐ Parent-Spectator
- ☐ Parent-Timer
- ☐ Coach
- ☐ Lifeguard
- ☐ Meet Official
- ☐ University Staff

**5. When did you attend the Maine Swimming Inc. Winter Combined Championships (you may choose more than one answer)?**

- ☐ All days and times
- ☐ Thursday, March 5, Evening
- ☐ Friday, March 6, Morning
- ☐ Friday, March 6 Evening
- ☐ Saturday, March 7 Morning
- ☐ Saturday, March 7 Evening
- ☐ Sunday, March 8 Morning
- ☐ Sunday, March 8 Evening

**6. What specific location or area in the pool building did you spend most (>75%) of your time (choose one answer)?**

- ☐ In the pool
- ☐ In the stands or bleachers
- ☐ Outside of pool area
- ☐ Inside locker room
- ☐ In the hallways/doorways leading out of pool area
- ☐ By concession stand

**7. Did you eat food from the university concession stand?**

- ☐ Yes
- ☐ No

**8. If yes, please check food consumed (you may choose more than one answer):**

- ☐ Hotdogs
- ☐ Sandwich
- ☐ Nachos
- ☐ Whoopie Pie
- ☐ Cookie
- ☐ Packaged snacks
- ☐ Drink

**9. How much time did you spend in the pool building (choose one answer)?**

- ☐ Less than one hour
- ☐ One hour
- ☐ Two hours
- ☐ 3 hours
- ☐ 4 hours
- ☐ 5 hours
- ☐ 6 hours or more

**10. Did you become ill after attending the Maine Swimming Inc. Winter Combined Championships?**

- ☐ Yes
- ☐ No

**11. If yes, what symptoms did you have(choose all that apply):**

- ☐ Burning eyes
- ☐ Watery eyes
- ☐ Sore throat
- ☐ Burning inside nose
- ☐ Wheezing
- ☐ Chest tightness
- ☐ Shortness of breath
- ☐ Coughing
- ☐ Sneezing
- ☐ Breathing difficulty
- ☐ Headache
- ☐ Blurry vision
- ☐ Dry mouth
- ☐ Nausea
- ☐ Vomiting
- ☐ Diarrhea
- ☐ Skin rash/irritation
- ☐ Fever
- ☐ Abdominal cramping
- ☐ Other

**12. If you became ill, could you give the date and time your illness started?**

Onset Date      MM    DD    YYYY    HH    MM    AM/PM  
                   /  /      :

**13. If you became ill what day did you feel better?**

Cure Date      MM    DD    YYYY  
                   /  /

**14. Did you see your health care provider for this illness?**

- ☐ Yes
- ☐ No

**15. If yes, what date?**

Date      MM    DD    YYYY  
           /  /

**16. Were you admitted to the hospital overnight for this illness?**

☐ Yes

☐ No

**17. If yes, what was the date of your admission?**

Admission date      MM      DD      YYYY  
                          /  /

**18. If yes, what is the name of the hospital?**

**19. Did you take over the counter medications for any symptoms?**

☐ Yes

☐ No

**20. Did you take any prescription medication for any symptoms?**

☐ Yes

☐ No

**2. Thank-you very much.**